

ACTIVE TORQUE CONTROL 4WD SYSTEM

PRECAUTION

1. TROUBLESHOOTING PRECAUTION

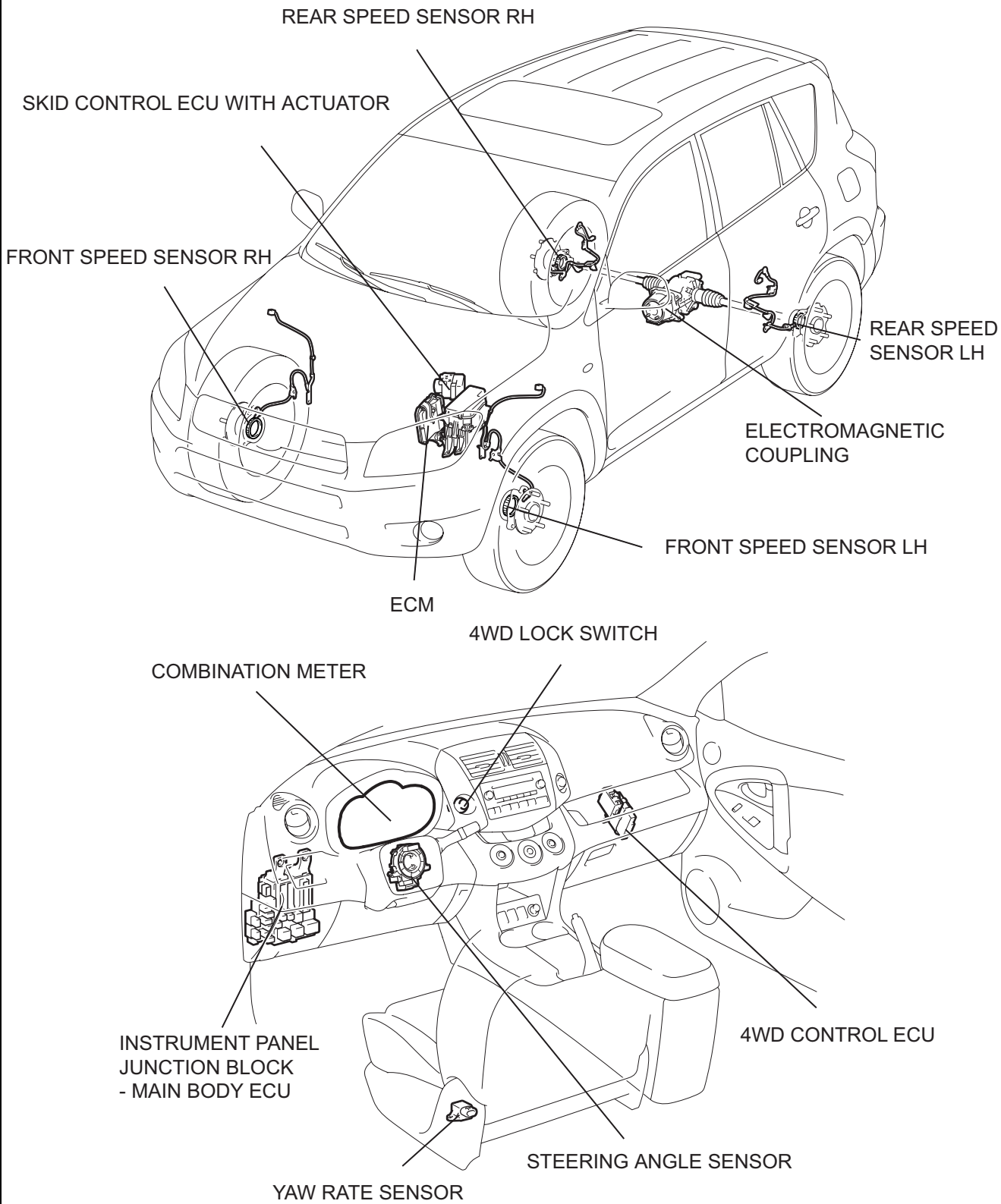
NOTICE:

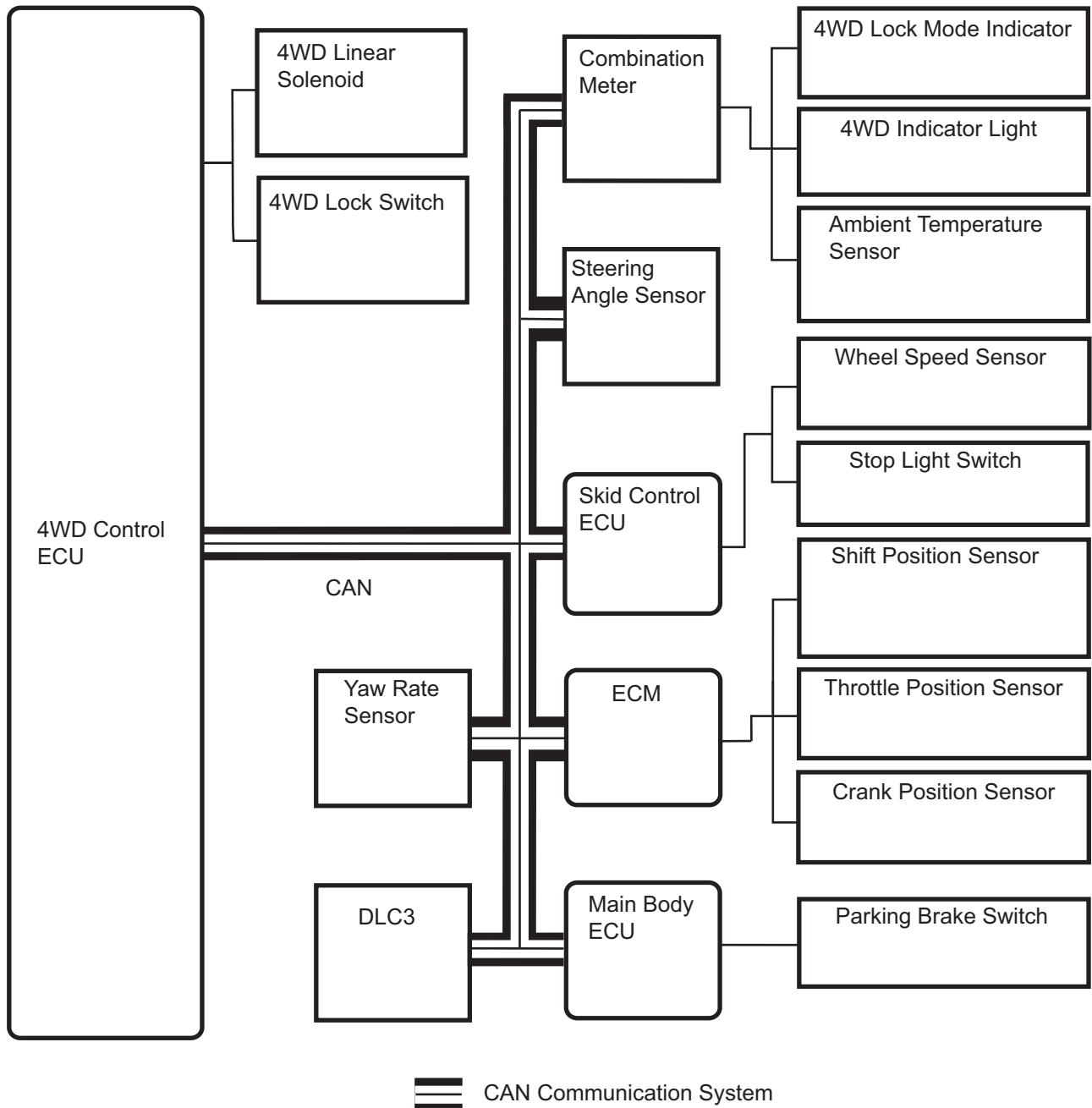
- Since the Active torque control system (4WD control system) may be influenced by a malfunction in other systems, be sure to check for DTCs in the other systems.
- When removing and installing the 4WD control ECU and each sensor, be sure to check that the normal display is output in test mode inspection and in DTC output inspection after installing all the parts.
- If the DTC of the CAN communication line is output, repair the malfunction in the communication line and troubleshoot the 4WD control system.
- Since the CAN communication line has its own length and route, it cannot be repaired temporarily with a bypass wire, etc.

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PARTS LOCATION

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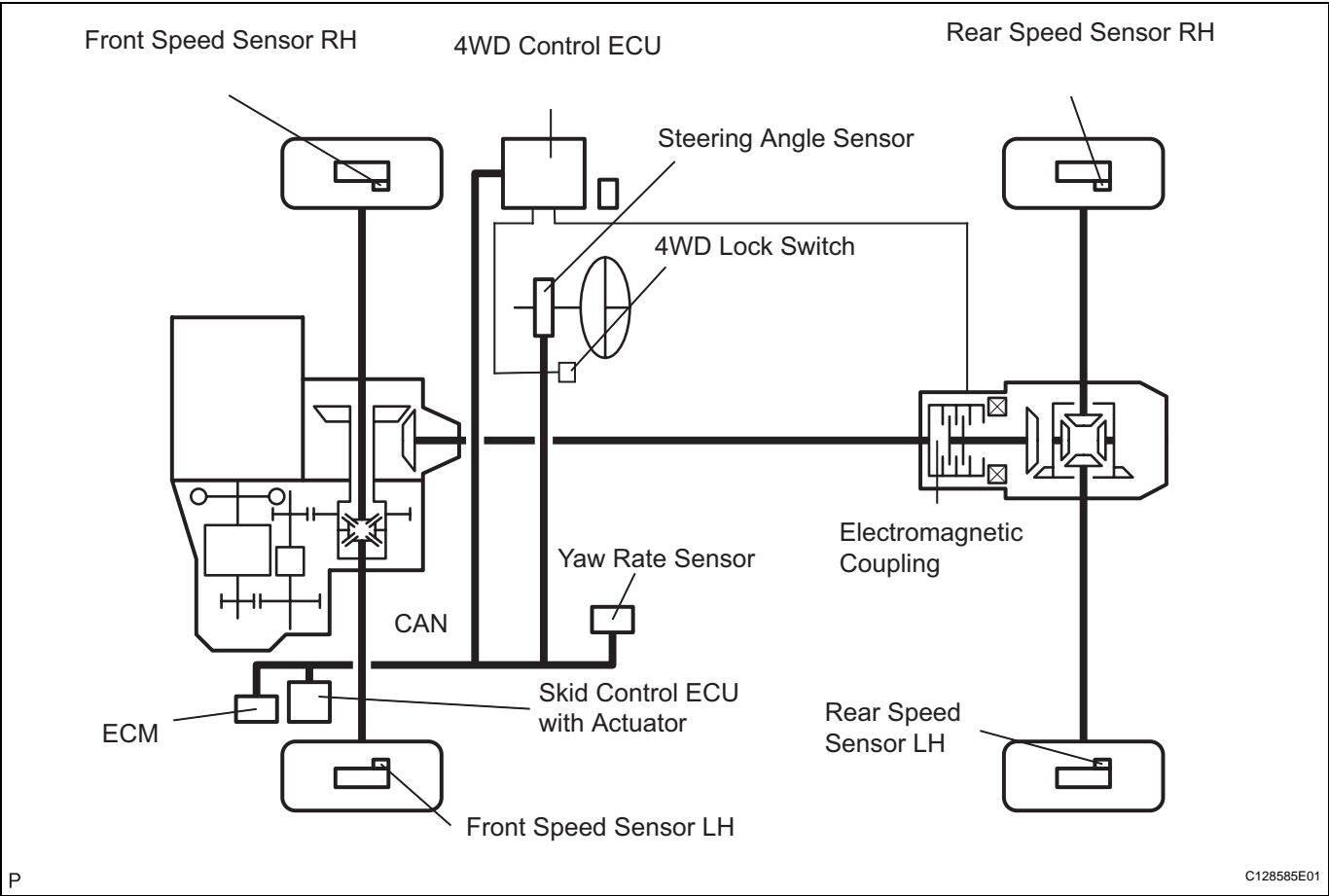


SYSTEM DIAGRAM**TF**

SYSTEM DESCRIPTION

1. GENERAL DESCRIPTION

- (a) The active torque control 4WD system detects the driving conditions based on signals from each ECU, each switch, the steering angle sensor, the wheel speed sensor, and the yaw rate sensor. The system controls the electronic current passing through the linear solenoid of the electromagnetic coupling, and performs electronic control to distribute the optimum torque to the rear wheels.



(b) Main components and their functions.

Component	Function
4WD Indicator Light	Displays warning to driver when system malfunctions
Stop Light Switch	Detects brake operation
Throttle Position Sensor	Detects opening angle of throttle
Park/Neutral Position Switch	Detects "P" position
Steering Angle Sensor	Detects turning of steering wheel
4WD Linear Solenoid	Detects electronic control limiting clutch operation using signals from 4WD control ECU
Skid Control ECU with Actuator	Detects signals from each sensor and outputs them to 4WD control ECU
4WD Control ECU	Detects signals from each sensor via skid control ECU to operate linear solenoid and control system
Crankshaft Position Sensor	Detects engine rpm and inputs it into ECM
Yaw Rate Sensor	Detects forward and rearward acceleration of vehicle, and inputs it into skid control ECU

Component	Function
Ambient Temperature	Detects external ambient temperature and inputs it into body ECU
Electromagnetic Coupling	Based on amount of current sent from 4WD control ECU, torque is distributed to rear wheels
4WD Lock Switch	Change of side auto mode for lock mode
4WD Lock Mode Indicator Light	Lock mode control status is communicated to driver through indicator light illumination When lock mode is turned ON, indicator light blinks twice and then remains illuminated. When lock mode is turned OFF, indicator light turns OFF.

2. DRIVING FUNCTION

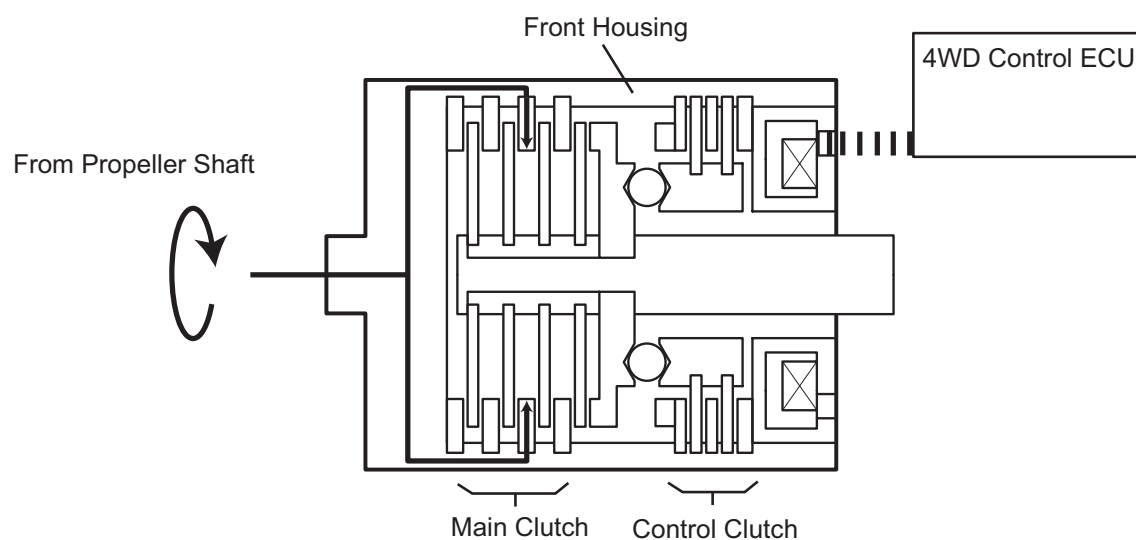
Vehicle Condition	Status
Control at Vehicle Startup	This controls the amount of sideway sliding that occurs at rear of vehicles when accelerating from stop to improve acceleration and hill climbing capacity
Slip Control at Vehicle Startup	This helps prevent vehicle from sliding sideways. When accelerating a stopped vehicle with the steering wheel turned, it ensures steering stability
Slip Control	This ensures high turning performance and that stability is not affected by road surface conditions during mid and high speed running
Control During Acceleration	This controls straight-line running when accelerating during mid and high speeds to ensure straight-line stability of the vehicle

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3. REFERENCE MECHANISM

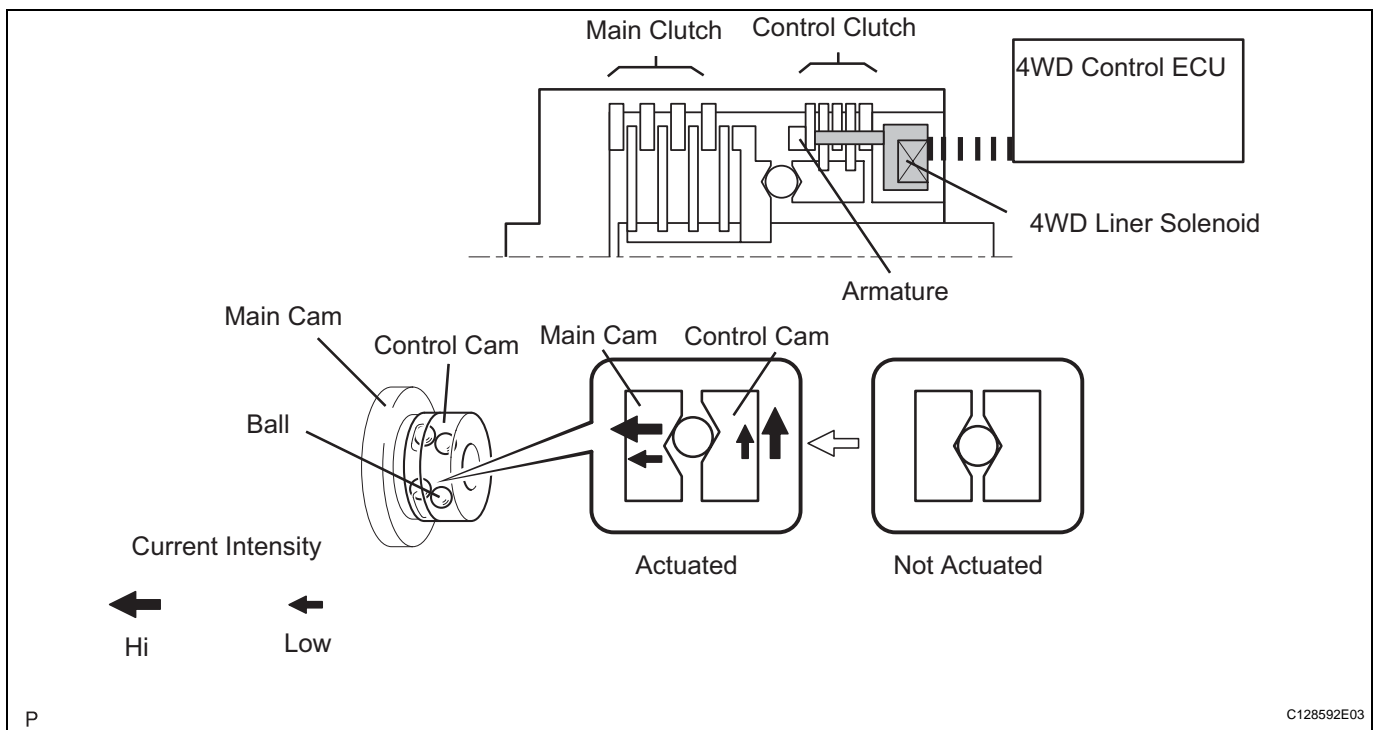
(a) Electromagnetic coupling

- (1) The outer part of the main clutch is attached together with the front housing. The inner part of the main clutch is attached together with the shaft. The control clutch is attached together with the control cam. The activation energy from the transfer is transferred from the propeller shaft to the front housing. However, when the linear solenoid is not operating, the main clutch and control clutch are in a free state, and the activation energy from the transfer is not transferred to the rear wheels.



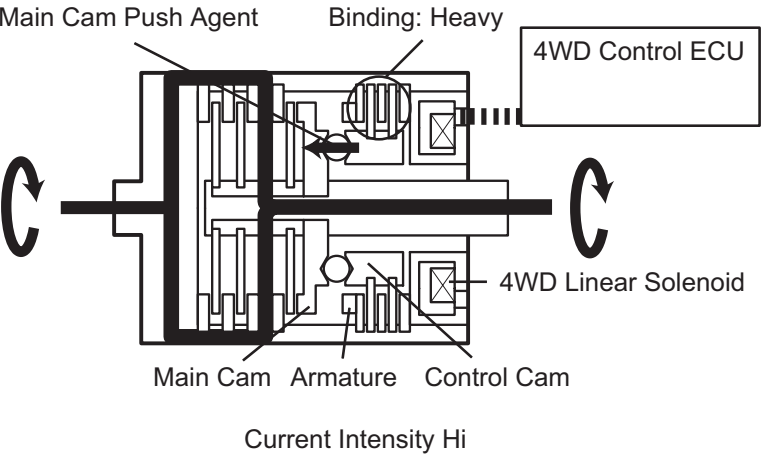
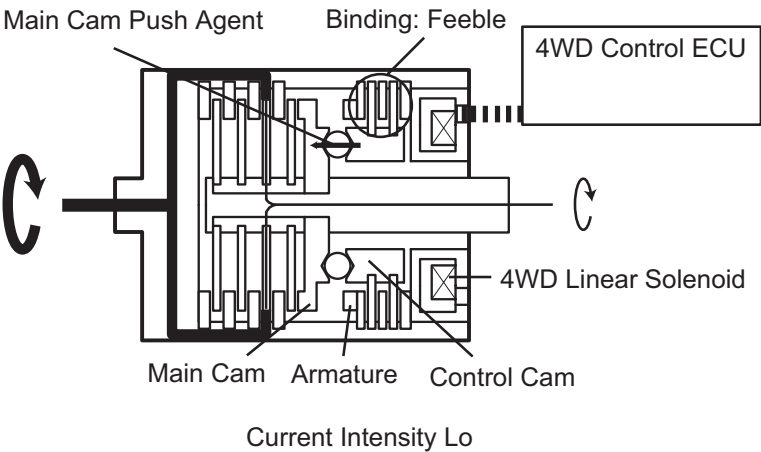
- (2) If current is applied to the linear solenoid, the solenoid magnetizes, and the electromagnet pull force causes the armature to attach to the control clutch side. Or, if there is a difference between the rotation speed of the front and rear wheels and the control clutch attaches, a difference occurs in the rotation of the main cam attached to the shaft and the control cam attached to the front housing. As a result, each ball pushes its cam, and the main clutch attaches. The activation energy from the front housing passes through main clutch to the shaft, and then to the rear differential. Then the activation energy is transferred to the rear wheels.

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- (3) Depending on the rotation difference between the front and rear wheels, the system controls the current flowing to the linear solenoid. Then the activation energy applied to the rear wheels is smoothly controlled. Depending on the amount of current, the restraint energy of the outer and inner side of the main clutch changes, and the activation energy from the propeller shaft is smoothly controlled from a limited condition to condition that is nearly a direct-link 4WD condition.

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HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use these procedures to troubleshoot the active torque control 4WD system.
- *: Use the intelligent tester (with CAN VIM).

1 VEHICLE BROUGHT TO WORKSHOP

NEXT

2 INSPECT BATTERY VOLTAGE

Standard voltage:

11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

3 CHECK COMMUNICATION FUNCTION OF CAN COMMUNICATION SYSTEM*

- (a) Use the intelligent tester (with CAN VIM) to check if the CAN communication system is functioning normally.

Result

Result	Proceed to
CAN DTC is not output	A
CAN DTC is output	B

B

Go to CAN COMMUNICATION SYSTEM

A

4 CHECK INDICATOR LIGHT

NEXT

5 CHECK DTC*

- (a) Check for DTCs (see page [TF-16](#)).
(b) Clear the DTCs.
(c) Recheck for DTCs.

Result

Result	Proceed to
DTC dose not reoccur	A
DTC dose reoccur	B

B

GO TO STEP 8

TF

A

6

PROBLEM SYMPTOMS TABLE

Result

Result	Proceed to
Fault not listed in problem symptoms table	A
Fault listed in problem symptoms table	B

B

Go to step 8

A

7

OVERALL ANALYSIS AND TROUBLESHOOTING*

- (a) Terminals of ECU (see page [TF-14](#)).
- (b) DATA LIST / ACTIVE TEST (see page [TF-18](#)).

NEXT

8

REPAIR OR REPLACE

NEXT

9

CONFIRMATION TEST

NEXT

END

TEST MODE PROCEDURE

1. DESCRIPTION

HINT:

When using a chassis dynamometer, brake tester, etc. to perform a vehicle test, activate test mode to avoid a "different tire diameter installed" incorrect judgment.

Test mode does not have a 4WD parameter. Test mode is activated because it will prohibit a different tire diameter judgment.

Control Status	4WD Control Status
During test mode	Different tire diameter malfunction judgment (detection that tire diameter of 4 wheels are not same) is not performed. Other than above item, normal control is performed. - 4WD lock switch OFF (4WD auto mode status) - 4WD lock switch ON (4WD lock mode status)

2. ACTIVATE TEST MODE

HINT:

Activate test mode before using a chassis dynamometer, brake tester, etc. to perform a vehicle test.

- (a) Check that the ignition switch is OFF.
- (b) Use either of the following methods to change the 4WD ECU to test mode.
 - (1) Test mode activation through intelligent tester (with CAM VIM).
 - Connect the intelligent tester (with CAM VIM) to the DLC3 connector and turn the ignition switch ON. Using the test mode activation function (mode 10), activate test mode.
 - (2) Test mode activation by shorting TS terminal
 - With the ignition switch OFF, short-circuit the TS and CG terminals of the DLC3 connector. Then turn the ignition switch ON to activate test mode.

NOTICE:

When the ignition switch is turned from OFF to ON, the 4WD indicator light will illuminate for 4 seconds. Then it will turn off.

4WD Lock Mode indicator

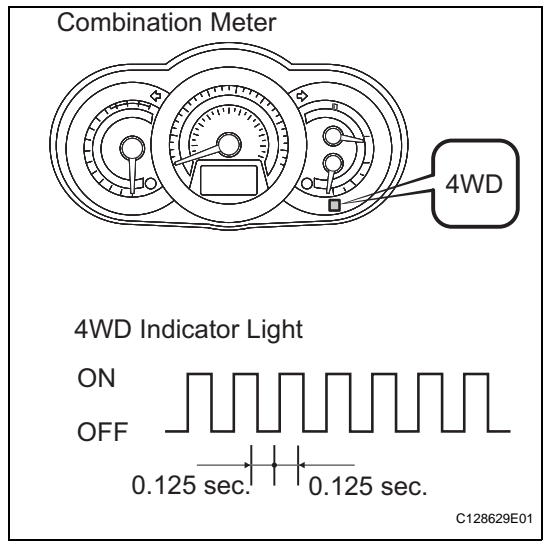
4WD Lock Switch OFF	Illuminates for 4 seconds, then turns OFF
4WD Lock Switch ON	Remains illuminated

HINT:

When the ignition switch is ON and the 4WD lock switch is turned from OFF to ON, the 4WD lock mode indicator blinks twice and then illuminates.

If the indicator does not illuminate, check the bulb for burnout. Also, inspect the wire harness between the 4WD ECU and combination meter.

NOTICE:
If a part of the 4WD system has a defect, the 4WD indicator light will illuminate.



- (c) Check if the 4WD indicator light has changed to the test mode display.
 - (d) Start the engine.
3. **CONFIRM MODE CHANGE**
HINT:
Operate the 4WD lock switch, and check that the 4WD control mode changes.

4WD Lock Switch Status	4WD Lock Mode Indicator Status	4WD Control Status
OFF	Turns off	4WD auto mode
ON	Illuminates	4WD lock mode
Switch changed from OFF to ON	Blinks twice, then illuminates	At moment of illumination, changes to 4WD lock mode

PROBLEM SYMPTOMS TABLE

HINT:

- Use the table below to help determine the cause of the problem symptom. The potential causes of the symptoms are listed in order of probability in the "Suspected area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- Inspect the fuses and relays related to this system before inspecting the suspected areas below.

Active torque control 4WD system

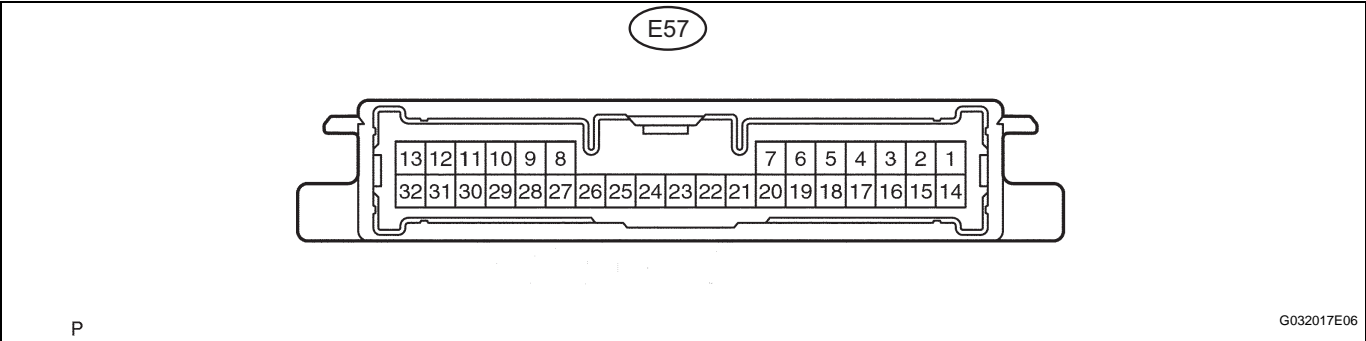
Symptom	Suspected area	See page
Phenomenon of tight-corner braking*	1.Steering angle sensor circuit	TF-27
	2.Linear solenoid circuit	TF-30
	3.4WD control ECU	
4WD indicator light remains ON	4WD indicator light circuit	TF-36
4WD indicator light does not come ON	4WD indicator light circuit	TF-40
The system is in the DTC output mode although terminals TC and CG of the DLC3 are not short circuited	1.TC and CG terminal circuit	TF-42
	2.4WD indicator light circuit	
The system is not in the DTC output mode although terminals TC and CG of the DLC3 are not short circuited	1.TC and CG terminal circuit	TF-42
	2.4WD indicator light circuit	

HINT:

*:When driving 4WD mode, the vehicle is hard to turn, as if the brakes were applied, due to the rotational difference between the front and rear tires while turning.

TERMINALS OF ECU

1. CHECK 4WD CONTROL ECU

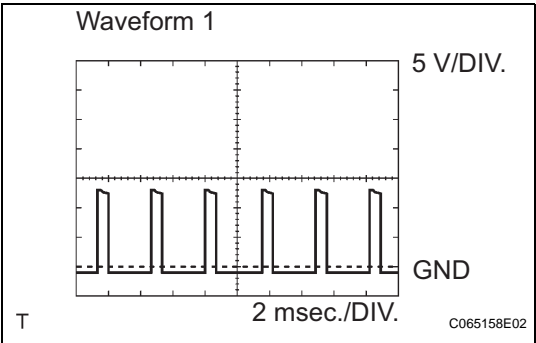


(a) Measure the voltage and resistance of the connector.

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
CANH (E57-14) - CANL (E57-16)	P - W	CAN communication	Ignition switch OFF	54 to 69 Ω
GND (E57-23) - Body ground	W-B - Body ground	Ground	Always	Below 1 Ω
4WDL (E57-7) - Body ground	R - W-B	Ground	4WD lock mode switch ON	Below 1 Ω
IG1 (E57-11) - GND (E57-23)	L - W-B	Power source voltage	Ignition switch ON	10 to 14 V
SLC+ (E57-13) - SLC- (E57-32)	W - B	4WD linear solenoid signal	Ignition switch ON	Pulse generation (See waveform 1)
BSLC (E57-9) - GND (E57-23)	R - W-B	Power source voltage	Ignition switch ON	10 to 14 V

If the result is not as specified, the 4WD control ECU may have a malfunction.

(b) Using an oscilloscope, check the waveform 1.
Waveform 1 (Reference)



Symbols (Terminal No.)	Content
Tool setting	5 V/DIV., 2 msec. / DIV.
Vehicle condition	Engine stop, ignition switch ON

DIAGNOSIS SYSTEM

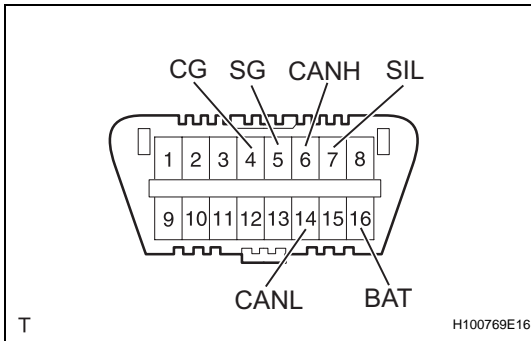
1. DESCRIPTION

Active torque control 4WD system data can be read in the Data Link Connector 3 (DLC3) of the vehicle. When the system seems to be malfunctioning, use the intelligent tester (with CAN VIM) to check for malfunctions and perform repairs. Therefore when there seems to be a problem with the active torque control 4WD, use the intelligent tester (with CAN VIM) or SST to check and troubleshoot it.

SST 09843-18040

2. CHECK DLC3

- (a) The ECU uses CAN (ISO11898-1) and ISO9141-2 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO9141-2 format. Verify the conditions listed in the table below.



Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus + line	During transmission	Pulse generation
CG (4) - Body Ground	Chassis ground	Always	Below 1Ω
SG (5) - Body Ground	Signal ground	Always	Below 1Ω
BAT (16) - Body Ground	Battery positive	Always	11 to 14 V
CANH (6) - CANL (14)	HIGH-level CAN bus line	Ignition switch OFF*	54 to 69 Ω
CANH (6) - BAT (16)	HIGH-level CAN bus line	Ignition switch OFF*	1 MΩ or higher
CANH (6) - CG (4)	HIGH-level CAN bus line	Ignition switch OFF*	200 Ω or higher
CANL (14) - BAT (16)	LOW-level CAN bus line	Ignition switch OFF*	1 MΩ or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Ignition switch OFF*	200 Ω or higher

NOTICE:

***: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the ignition switch, other switches or the doors.**

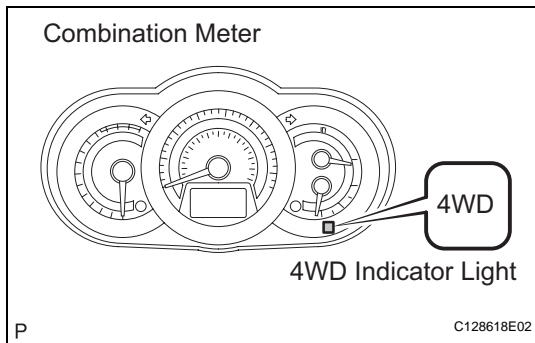
If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

HINT:

Connect the cable of the intelligent tester (with CAN VIM) to the DLC3, turn the ignition switch ON and attempt to use the tester. If the display indicates that a communication error has occurred, there is a problem either with the vehicle or with the tester.

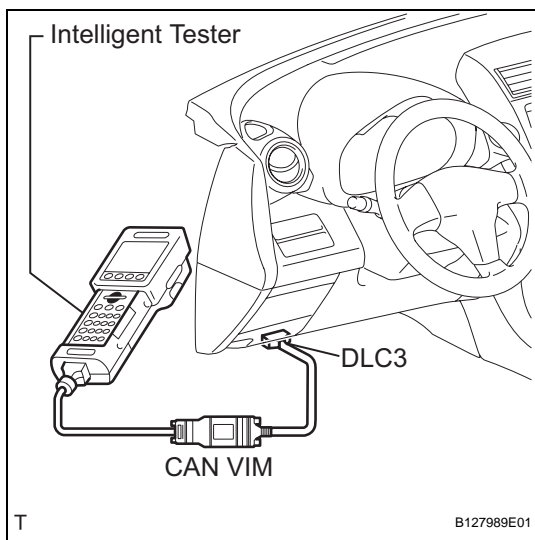
- If communication is normal when the tester is connected to another vehicle, inspect the DLC3 of the original vehicle.

- If communication is still not possible when the tester is connected to another vehicle, the problem may be in the tester itself. Consult the Service Department listed in the tester's instruction manual.



3. INDICATOR LIGHT

- When a problem occurs in the active torque control 4WD system, the 4WD indicator light on the combination meter comes ON to inform the driver of the problem.



DTC CHECK / CLEAR

1. CHECK DTC (When Using Intelligent Tester)

- Check the DTCs.
 - Connect the intelligent tester (with CAN VIM) to the DLC3.
 - Turn the ignition switch ON.
 - Read the DTCs by following the prompts on the tester screen.

HINT:

Refer to the intelligent tester (with CAN VIM) operator's manual for further details.

2. CLEAR DTC (When Using Intelligent Tester)

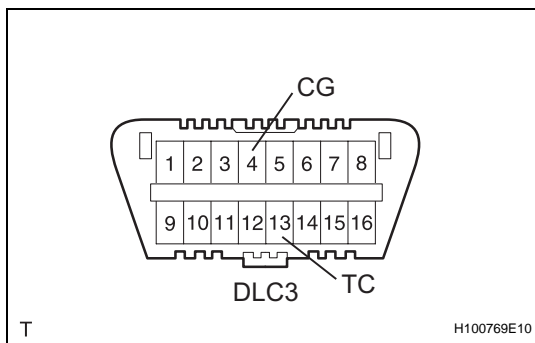
- Connect the intelligent tester (with CAN VIM) to the DLC3.
- Turn the ignition switch ON.
- Operate the intelligent tester (with CAN VIM) to clear the codes.

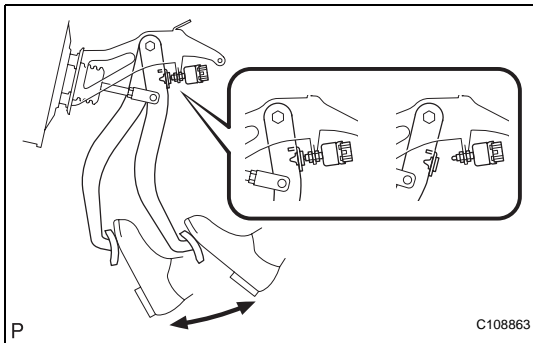
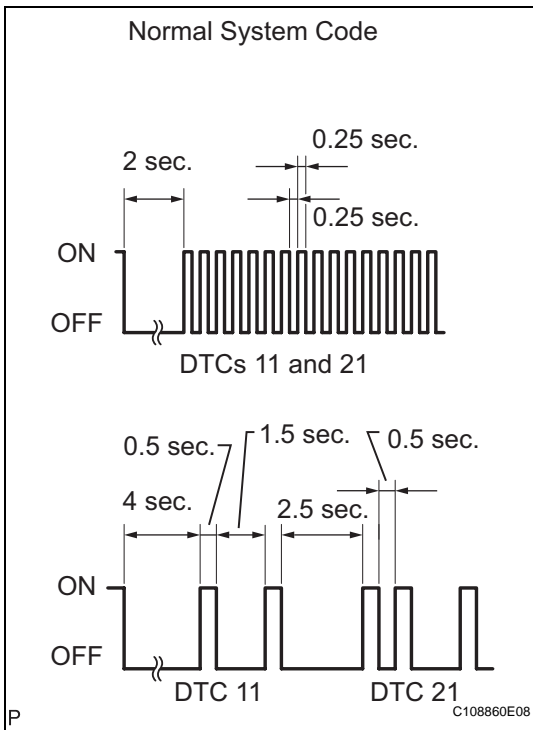
HINT:

Refer to the intelligent tester (with CAN VIM) operator's manual for further details.

3. CHECK DTC (When not Using Intelligent Tester)

- Check the DTCs.
 - Using the SST, connect terminals TC (13) and CG (4) of the DLC3
SST 09843-18040
 - Turn the ignition switch ON.





(3) Read DTCs from the 4WD indicator light ON the combination meter.

HINT:

- If the 4WD indicator light does not blink, perform relevant troubleshooting procedures. The relevant troubleshooting procedures are in the sections listed in the table below.
- If more than 1 DTC is detected at the same time, the DTCs will be displayed in numerical order.
- As an example, the blinking patterns of the normal system code and DTCs 11 and 21 are shown below.
- DTCs are explained in "DIAGNOSTIC TROUBLE CODE CHART" (see page [TF-19](#)).

Section Title	See Procedure
4WD Indicator Light does not Come ON	TF-40
TC and CG Terminal Circuit	TF-42

4. CLEAR DTC (When not Using Intelligent Tester)

- (a) Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

SST 09843-18040

- (b) Turn the ignition switch ON.
- (c) Clear the DTCs stored in the 4WD control ECU by depressing the brake pedal 8 times or more within 5 seconds.
- (d) Check that the warning light blinks in the normal system code pattern.
- (e) Remove SST from the terminals of the DLC3.
- (f) Turn the ignition switch OFF.

HINT:

DTCs cannot be cleared by disconnecting the cable from the negative (-) battery terminal or removing the ECU-IG1 fuse.

FAIL-SAFE CHART

1. FAIL-SAFE FUNCTION

- If following malfunctions occur, the 4WD control ECU will stop the function of 4WD control system or partly change the function to control the system.
- If a malfunction occurs in the sensor signal or actuator, the flow of electricity to the linear solenoid of the electrical coupling is prohibited. As a result, the system enters front wheel drive condition.
- When a component of the system malfunctions and the fail-safe function activates, the component operation is prohibited. However, if the system is controlling the component and the fail-safe function activates, the system operation is gradually stopped to prevent sudden changes in the vehicle condition.
- When system control is not possible, the warning light is illuminated to stop operation of the system operation.

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the intelligent tester's (with CAN VIM) DATA LIST allows switch, sensor and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

- (a) Connect the intelligent tester (with CAN VIM) to the DLC3.
- (b) Turn the ignition switch ON.
- (c) Read the DATA LIST according to the display on the tester.

TF

4WD control ECU

Item	Measurement Item/Range (Display)	Normal Condition	Diagnostic Note
4WD WARN LAMP	4WD indicator light /OFF or ON	OFF: 4WD indicator light OFF ON: 4WD indicator light ON	-
SLIP INDI LAMP	Slip indicator light /OFF or ON	OFF: SLIP indicator light OFF ON: SLIP indicator light ON	-
STOP LAMP SW	Stop light switch /OFF or ON	OFF: Brake pedal released ON: Brake pedal depressed	-
STEERING ANGLE	Steering angle value / Min.: -3276.8 deg Max.: 3276.7 deg	Min.: -3276.8 deg Max.: 3276.7 deg	-
FR WHEEL SPD	FR wheel speed / Min.: 0 km/h (0 mph) Reading : Max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Almost no difference from the speedometer
FL WHEEL SPD	FL wheel speed / Min.: 0 km/h (0 mph) Reading : Max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Almost no difference from the speedometer
RR WHEEL SPD	RR wheel speed / Min.: 0 km/h (0 mph) Reading : Max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Almost no difference from the speedometer
RLWHEEL SPD	RL wheel speed / Min.: 0 km/h (0 mph) Reading : Max.: 326.4 km/h (202.8 mph)	Actual wheel speed	Almost no difference from the speedometer
AMBI TEMP	Ambient temperature / Min.: -128 °C (198.4 °F) Max.: 127 °C (260.6 °F)	Min.: -128 (198.4 °F) Max.: 127 (260.6 °F)	-
COOLANT TEMP	Engine coolant temperature / Min.: 0 °C (32 °F) Max.: 127.5 °C (261.5 °F)	Min.: 0 °C (32 °F) Max.: 127.5 °C (261.5 °F)	-
LOCK SW	4WD lock switch / OFF or ON	OFF: 4WD lock switch off ON: 4WD lock switch on	-
SLC CUR	SLC solenoid (4WD linear solenoid) current / Min.: 0 A Max.: 3 A	Min.: 0 A Max.: 3 A	-

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2. PERFORM ACTIVE TEST

- HINT:
Performing the intelligent tester's (with CAN VIM) ACTIVE TEST allows switch and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time. The DATA LIST can be displayed during the ACTIVE TEST.
- (a) Connect the intelligent tester (with CAN VIN) to the DLC3.
 - (b) Turn the ignition switch ON.
 - (c) Perform the ACTIVE TEST according to the display on the tester.

4WD control ECU

Item	Test Details	Diagnostic Note
4WD WARN LAMP	4WD indicator light ON / OFF ON: 4WD indicator light ON OFF: 4WD indicator light OFF	Observe combination meter
LOCK LAMP	4WD lock light / ON / OFF OFF: 4WD lock switch OFF ON: 4WD lock switch ON	Observe combination meter

Skid control ECU

Item	Test Details	Diagnostic Note
SLIP INDI LAMP	SLIP indicator Light / ON / OFF ON: SLIP indicator light ON OFF: SLIP indicator light OFF	Observe combination meter

DIAGNOSTIC TROUBLE CODE CHART

DTC No.	Detection Item	Trouble Area	See page
C1241/94	Low Power Supply Voltage	-Battery -generator -ECU-IG1 -Wire harness -4WD control ECU	TF-21
C1280/82	Engine Circuit Malfunction	-Throttle position sensor -Throttle position sensor wire harness and connector -CAN communication system	TF-24
C1296/96	ABS Malfunction	-Wire harness -4WD control ECU -Skid control ECU -Speed sensor -Yaw rate sensor -CAN communication system	TF-25
C1297/97	Steering Angle Sensor	-Steering angle sensor -CAN communication system -Wire harness -4WD control ECU	TF-27
C1298/98	Linear Solenoid Circuit	-Wire harness -Electromagnetic coupling -4WD control ECU	TF-30
C1299/99	Cancellation of 4WD Control	-Tire size -Electromagnetic coupling -4WD control ECU	TF-32
U0073/86	Control Module Communication Bus OFF	-Wire harness (CANH, CANL circuit) -4WD control ECU	TF-34
U0100/85	Lost Communication with ECM / PCM "A"	-Wire harness (CANH, CANL circuit) -4WD control ECU -ECM	TF-34
U0126/84	Lost Communication with Steering Angle Sensor Module	-Wire harness (CANH, CANL circuit) -4WD control ECU -Steering angle sensor	TF-34
U0129/83	Lost Communication with Brake System Control Module	-Wire harness (CANH, CANL circuit) -4WD control ECU -Skid control ECU	TF-34

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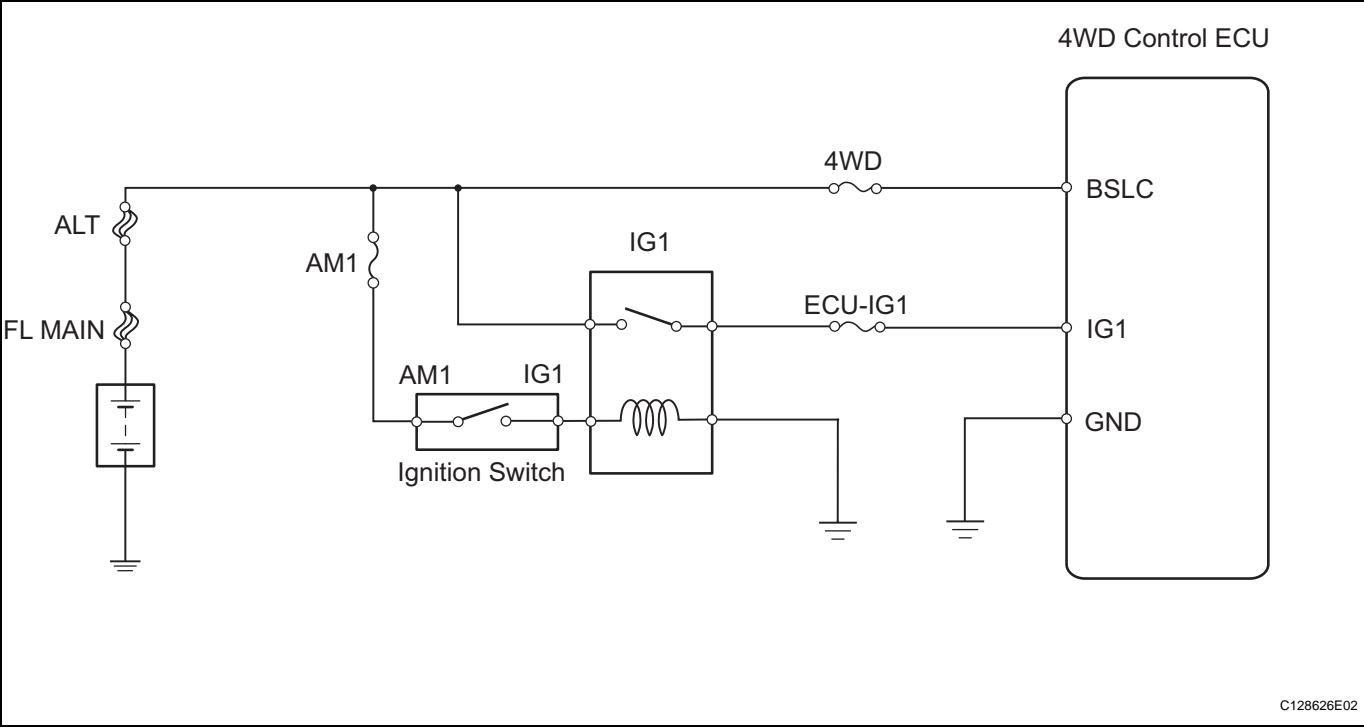
DTC	C1241/94	Low Power Supply Voltage
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DESCRIPTION

If a malfunction in the power source circuit occurs, or a malfunction in communication with the skid control ECU or in a speed sensor occurs, the 4WD control ECU will prohibit operations by the fail-safe function.

DTC No.	DTC Detection Condition	Trouble Area
C1241/94	When one of following conditions is met: 1. When following continues for 10 seconds or more: - At a vehicle speed of 3 km/h (2 mph) or more, voltage of IG1 terminal is 9.5 V or less. 2. When both of following continue for 60 seconds or more: - With the voltage of IG1 terminal 9.5 V or less, communication with the skid control ECU cannot be performed. - A malfunction in communication with skid control ECU. 3. When following continue for 3 seconds or more: - With the voltage of IG1 terminal 9.5 V or more, communication with the skid control ECU cannot be performed.	<ul style="list-style-type: none">• Battery• Generator• ECU-IG1• Wire harness (IG1 circuit, GND circuit)• 4WD control ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Check the condition of each related circuit connector before troubleshooting (see page [IN-37](#)).

1 CHECK FOR DTC

- (a) Clear the DTC (see page [TF-16](#)).
- (b) Turn the ignition switch ON and check that no CAN communication system DTC is output.
- (c) Start the engine.
- (d) Drive the vehicle, accelerate to a speed of 3 km/h (2 mph) or more, and check that no speed sensor DTC (brake control system DTC) is output (see page [BC-57](#)).

Result

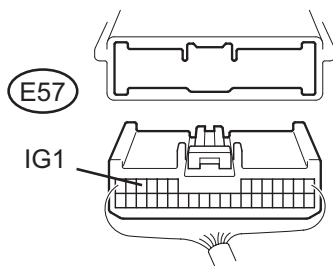
Result	Proceed to
Neither CAN communication system DTC nor speed sensor DTC (Brake control system DTC) is output	A
CAN communication system DTC is output	B
Speed Sensor DTC (Brake control system DTC) is output	C

B**REPAIR CIRCUIT INDICATOR BY OUTPUT CODE (CAN COMMUNICATION SYSTEM)****C****REPAIR CIRCUIT INDICATOR BY OUTPUT CODE (BRAKE CONTROL SYSTEM)****A****2 INSPECT FUSE (ECU-IG)**

- (a) Remove the ECU-IG1 fuse from the instrument junction block
- (b) Measure the resistance of the fuse.

Standard resistance:**Below 1Ω****HINT:**Check for short circuits in all harnesses and connector connected to the ECU-IG1 fuse (see page [IN-5](#)).**NG****REPLACE FUSE****OK****3 CHECK WIRE HARNESS (4WD CONTROL ECU - BATTERY)**

Wire Harness Side



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C107387E11

- (a) Disconnect the E57 ECU connector.
- (b) Measure the voltage of the wire harness side connector.

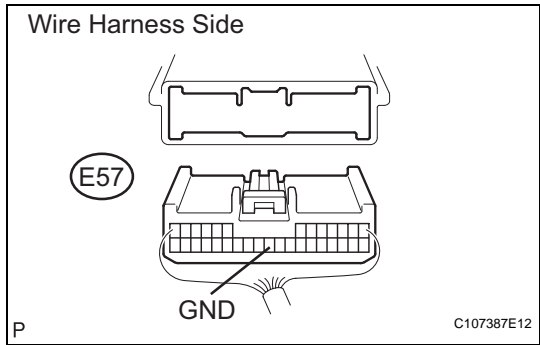
Standard voltage

Tester Connection	Condition	Specified Condition
E57-11 (IG1) - Body Ground	Ignition switch ON	10 to 14 V

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****TF**

OK

4 CHECK WIRE HARNESS (4WD CONTROL ECU - BODY GROUND)



- (a) Disconnect the E57 ECU connector.
- (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
E57-23 (GND) - Body Ground	Below 1 Ω

NG REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5 RECONFIRM DTC

- (a) Clear the DTC (see page [TF-16](#)).
- (b) Start the engine.
- (c) Drive the vehicle, accelerate to a speed of 3 km/h (2 mph or more, and check if the same DTC is output.

Result

Result	Proceed to
DTC is output	A
DTC is not output	B

HINT:
Reinstall the sensor, connectors, etc. and restore the vehicle to its prior condition before rechecking DTCs.

B END

A

REPLACE 4WD CONTROL ECU

DTC**C1280/82****Engine Circuit Malfunction****DESCRIPTION**

If a malfunction in the engine control ECU circuit occurs, the 4WD control ECU will output this DTC.

DTC No.	DTC Detection Condition	Trouble Area
C1280/82	When the following continues for 5 seconds or more: - Communication with engine control ECU is operating normally, but throttle position sensor is malfunctioning.	<ul style="list-style-type: none"> Throttle position sensor Throttle position sensor wire harness and connector CAN communication system

TF**INSPECTION PROCEDURE**

HINT:

Check the condition of each related circuit connector before troubleshooting (see page [IN-37](#)).

1**CHECK FOR DTC**

- Clear the DTC (see page [TF-16](#)).
- Turn the ignition switch OFF.
- Turn the ignition switch ON and check that can communication system DTC is not output.

Result

Result	Proceed to
CAN communication system DTC is output	A
Engine control DTC is output	B

B**GO TO ENGINE CONTROL SYSTEM****A****GO TO CAN COMMUNICATION SYSTEM**

DTC**C1296/96****ABS Malfunction****DESCRIPTION**

If a malfunction in the speed sensor signal circuit yaw rate sensor circuit occurs, the 4WD control ECU will output this DTC.

DTC No.	DTC Detection Condition	Trouble Area
C1296/96	When either condition below is met: 1. Wheel speed sensor malfunction is received from skid control ECU 2. Deceleration sensor malfunction is received from skid control ECU	<ul style="list-style-type: none"> CAN communication line Skid control ECU Speed sensor 4WD control ECU Yaw rate sensor Wire harness

INSPECTION PROCEDURE

HINT:

Check the condition of each related circuit connector before troubleshooting (see page [IN-37](#)).

1**CHECK FOR DTC**

- Clear the DTC (see page [TF-16](#)).
- Turn the ignition switch OFF.
- Turn the ignition switch ON again and check that CAN communication system DTC(s) is not output.
- Drive the vehicle, accelerate to a speed of 20 km/h (12 mph) or more, and check if the speed sensor DTC (brake control system DTC) is output (see page [BC-57](#)).

Result

Result	Proceed to
Neither CAN communication system DTC nor brake control system DTC is output	A
CAN communication system DTC is output	B
Brake control system DTC (speed sensor DTC) is output	C

HINT:

When DTCs indicating a CAN communication system malfunction are output, repair the CAN communication system before repairing each corresponding sensor.

B

REPAIR CIRCUIT INDICATOR BY OUTPUT CODE (CAN COMMUNICATION SYSTEM)

C

REPAIR CIRCUIT INDICATOR BY OUTPUT CODE (BRAKE CONTROL SYSTEM)

A**2****CHECK OPERATION OF 4WD CONTROL ECU**

- Replace the 4WD control ECU with a normally functioning or new one.
- Reconfirm DTC.

OK:
DTC is output.

OK

REPLACE 4WD CONTROL ECU

NG

GO TO BRAKE CONTROL SYSTEM (ANTI-LOCK BRAKE SYSTEM OR VEHICLE STABILITY CONTROL SYSTEM)

TF

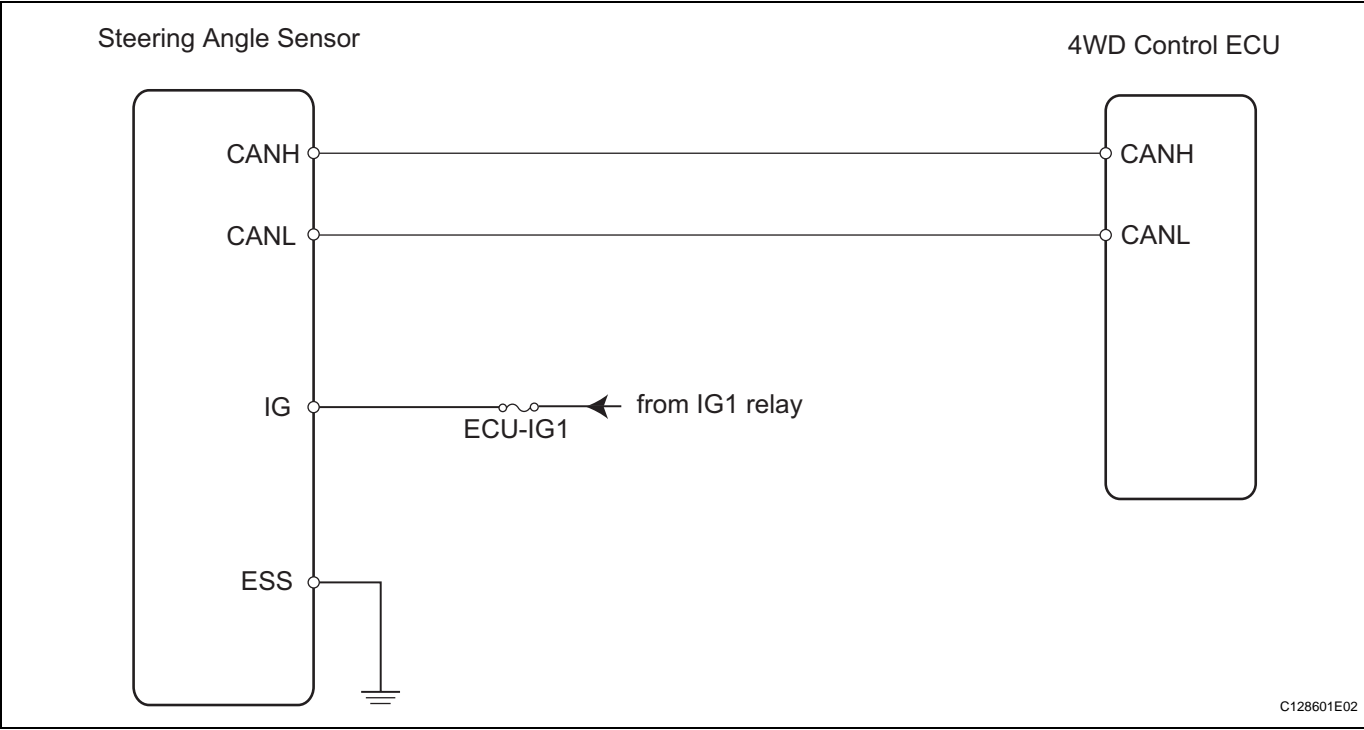
DTC	C1297/97	Steering Angle Sensor
-----	----------	-----------------------

DESCRIPTION

- The 4WD control ECU determines that the vehicle is turning based on the signals sent from the steering angle sensor.
- The steering angle sensor signal is sent to the 4WD control ECU via the CAN communication system.
- The 4WD control ECU detects the amount of steering wheel movement and performs "slip control at vehicle start up", according to the amount of movement, and "slip control" to secure high turning performance.

DTC No.	DTC Detection Condition	Trouble Area
C1297/97	When voltage of 4WD control ECU IG1 terminal is 9.5 V or more, and steering angle sensor malfunction signal is received.	<ul style="list-style-type: none">• Steering angle sensor• CAN communication• 4WD control ECU• Wire harness

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:
Check the condition of each related circuit connector before troubleshooting (see page [IN-37](#)).

1	CHECK FOR DTC
---	---------------

- (a) Clear the DTC (see page [TF-16](#)).
- (b) Turn the ignition switch OFF.
- (c) Turn the ignition switch ON again and check that no CAN communication system DTC(s) is output.
- (d) Start the engine.

- (e) Drive the vehicle and turn the steering wheel to the right and left at a speed of 35 km/h (24 mph) and check that no brake control system (steering angle sensor) DTC (C1231/31) is output (see page BC-57).

Result

Result	Proceed to
Neither CAN communication system DTC nor brake control system DTC is out put	A
CAN communication system DTC is output	B
Brake control system (steering angle sensor) DTC (C1231/31) is output	C

HINT:

When DTCs indicating a CAN communication system malfunction are output, repair the CAN communication system before repairing each corresponding sensor.

B

REPAIR CIRCUIT INDICATOR OUTPUT CODE (CAN COMMUNICATION SYSTEM)

C

REPAIR OR REPLACE CIRCUIT INDICATOR OUTPUT CODE (STEERING ANGLE SENSOR CIRCUIT)

A**2****CHECK WIRE HARNESS (STEERING ANGLE SENSOR - BATTERY)**

Wire Harness Side

E11

IG

P

C107442E10

- (a) Disconnect the E11 sensor connector.
(b) Measure the voltage of the wire harness side connector.

Standard voltage

Tester Condition	Condition	Specified Condition
E11-1 (IG) - Body ground	Ignition switch ON	10 to 14 V

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK**3****CHECK WIRE HARNESS (STEERING ANGLE SENSOR - BODY GROUND)**

Wire Harness Side

E11

ESS

P

C107442E11

- (a) Disconnect the E11 sensor connector.
(b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Condition	Specified Condition
E11-2 (ESS) - Body ground	Below 1 Ω

TF

Result

Result	Proceed to
OK (When troubleshooting according to PROBLEM SYMPTOMS TABLE)	A
OK (When troubleshooting according to DTC chart)	B
NG	C

TF



PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE



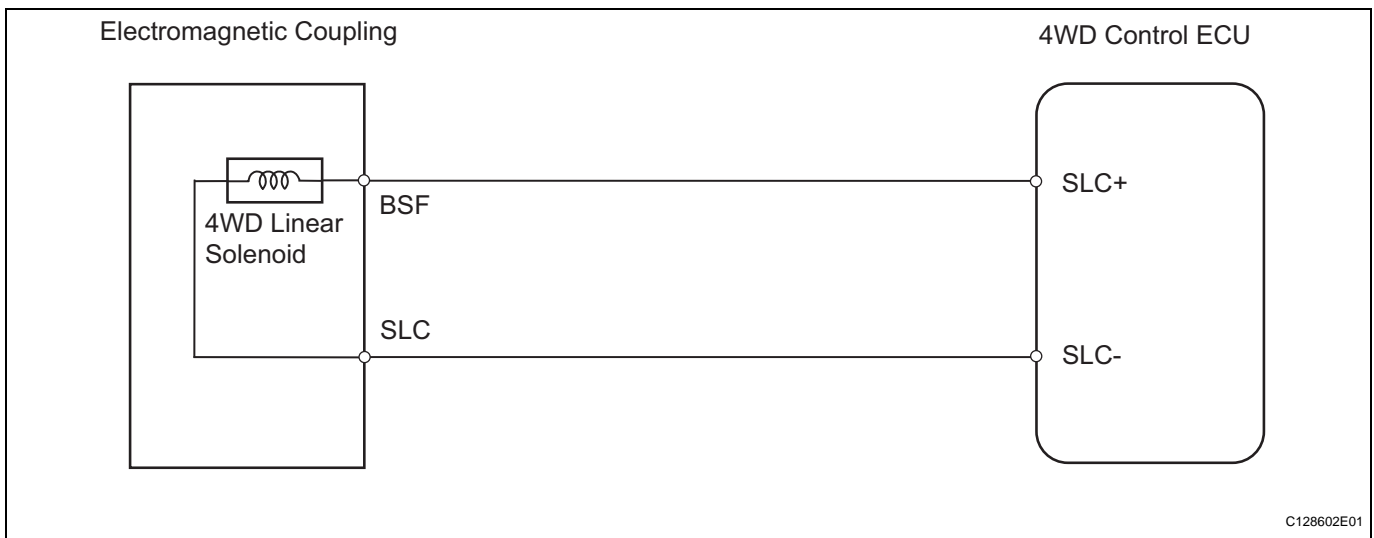
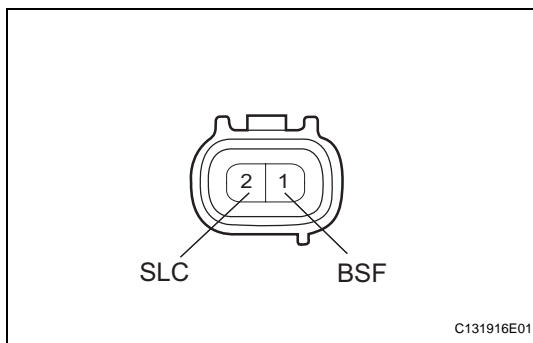
REPAIR OR REPLACE HARNESS AND CONNECTOR

REPLACE STEERING ANGLE SENSOR

DTC**C1298/98****Linear Solenoid Circuit****DESCRIPTION**

The 4WD control ECU receives signals from each sensor to control clutch fluid pressure for limiting the center differential operation, which distributes torque according to the driving conditions.

DTC No.	DTC Detection Condition	Trouble Area
C1298/98	1. When the following continues for 1 second or more: - With the current of the 0.8 A or more, an open or short in the linear solenoid circuit occurs.	<ul style="list-style-type: none"> Wire harness Electromagnetic coupling 4WD control ECU

TF**WIRING DIAGRAM****INSPECTION PROCEDURE****1****INSPECT ELECTROMAGNETIC COUPLING (4WD LINEAR SOLENOID)**

- Remove the coupling connector.
- Measure the resistance of the solenoid.

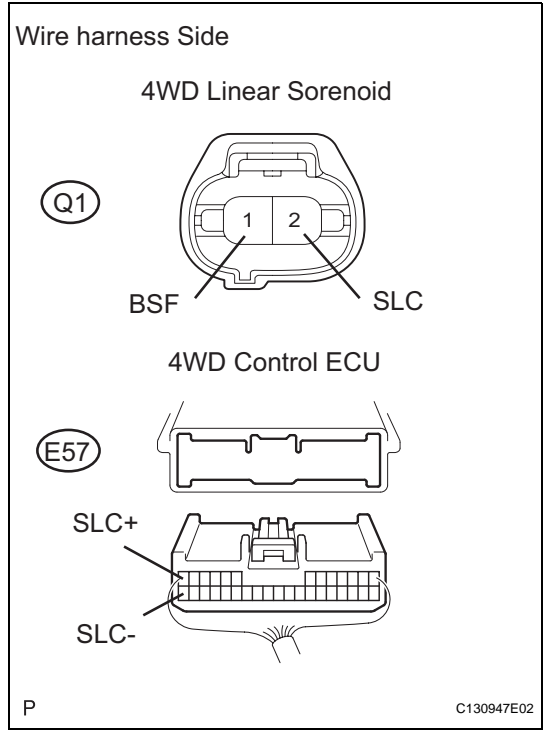
Standard resistance

Tester Connection	Specified Condition
1 (BSF) - 2 (SLC)	2.2 to 2.6 Ω
1 (BSF) - Body ground	10 k Ω or higher
2 (SLC) - Body ground	10 k Ω or higher

NG**REPLACE ELECTROMAGNETIC COUPLING****OK**

2

CHECK WIRE HARNESS (COUPLING - 4WD CONTROL ECU)



- (a) Disconnect the E57 ECU connector.
- (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
E57-13 (SLC+) - Q1-1 (BSF)	Below 1 Ω
E57-32 (SLC-) - Q1-2 (SLC)	Below 1 Ω
E57-13 (SLC+) - Body ground	10 kΩ or higher
E57-32 (SLC-) - Body ground	10 kΩ or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE 4WD CONTROL ECU

DTC**C1299/99****Cancellation of 4WD Control****DESCRIPTION**

- If wheel slip continues, differential control will be disabled when the torque-distribution ratio of the differential clutch exceeds the set value and a malfunction in the output of the wheel speed sensors, etc. occurs.
- If a difference in diameter between the front and rear wheels is determined, differential control will be disabled.

DTC No.	DTC Detection Condition	Trouble Area
C12299/99	When one of following following conditions is met: <ul style="list-style-type: none">- Control coupling lock is detected 4 more times.- Condition that controls coupling calorific value is predefined value or more.- Condition that transfer oil temperature is predefined value or more.- Vehicle is driven and energy load tire radius difference between front tires and rear tires is more than 3%	<ul style="list-style-type: none">• Electromagnetic coupling• Tire size• 4WD control ECU

TF**INSPECTION PROCEDURE**

HINT:

Check the condition of each related circuit connector before troubleshooting (see page [IN-37](#)).**1****CHECK TIRE CONDITION**

- (a) Check the size and condition of all 4 tires (see page [TW-1](#)).

HINT:

This DTC is output when tire deformation or a difference in tire size is detected.

OK:**The diameter and air pressure of all 4 tires are the same.****NG****REPLACE TIRE SO THAT ALL 4 TIRES ARE THE SAME IN SIZE****OK****2****RECONFIRM DTC**

- (a) Clear the DTC (see page [TF-16](#)).
- (b) Start the engine.
- (c) Drive the vehicle at the speed of 20 km/h (12 mph) or more and check that same DTC is output.

Result

Result	Proceed to
DTC is output	A
DTC is not output	B

B**REPLACE ELECTROMAGNETIC COUPLING**



REPLACE 4WD CONTROL ECU

DTC	U0073/86	Control Module Communication Bus OFF
DTC	U0100/85	Lost Communication with ECM / PCM "A"
DTC	U0126/84	Lost Communication with Steering Angle Sensor Module
DTC	U0129/83	Lost Communication with Brake System Control Module

TF

DESCRIPTION

- The 4WD control ECU inputs the signals sent from the ECM, skid control ECU, and steering angle sensor via the CAN communication system.
- When DTCs indicating a CAN communication system malfunction are output, repair the CAN communication system before repairing each corresponding sensor.

DTC No.	DTC Detection Condition	Trouble Area
U0073/86	<ol style="list-style-type: none"> 1. When the following continues for 5 seconds or more: <ul style="list-style-type: none"> - Signals from the 4WD control ECU are not received. 2. When the following occurs 10 times consecutively: <ul style="list-style-type: none"> - A communication malfunction (bus off) occurs one or more times within 0.1 second. 	<ul style="list-style-type: none"> • Wire harness (CANL, CANH circuit) • 4WD control ECU
U0100/85	<ol style="list-style-type: none"> 1. When both of the following continue for 2 seconds or more: <ul style="list-style-type: none"> - The voltage of the IG1 terminal is 10 V or more. - At a vehicle speed of 60 km/h (38 mph) or more, communication with the ECM cannot be performed 	<ul style="list-style-type: none"> • Wire harness (CANL, CANH circuit) • 4WD control ECU • ECM
U0126/84	<ol style="list-style-type: none"> 1. When both of the following continue for 1 second or more: <ul style="list-style-type: none"> - The voltage of the IG1 terminal is 10 V or more. - Communication with the steering angle sensor cannot be performed. 2. When all of the following occur 10 times consecutively: <ul style="list-style-type: none"> - The condition that communication with the steering angle sensor cannot be performed occurs once within 5 seconds - The voltage of the IG1 terminal is 10 V or more. - Occurs 10 times or more within 60 seconds. 	<ul style="list-style-type: none"> • Wire harness (CANL, CANH circuit) • 4WD control ECU • Steering angle sensor
U0129/83	<ol style="list-style-type: none"> 1. When the following continues for 3 seconds or more: <ul style="list-style-type: none"> - The voltage of the IG1 terminal is 10 V or more. - Communication with the skid control ECU cannot be performed. 	<ul style="list-style-type: none"> • Wire harness (CANL, CANH circuit) • 4WD control ECU • Skid control ECU

INSPECTION PROCEDURE**1****CHECK FOR DTC**

- (a) Check for DTC (see page [TF-16](#)).
- (b) Record the output DTC (4WD control system).

HINT:

When DTCs indicating a CAN communication system malfunction are output, repair the CAN communication system before repairing each corresponding sensor.

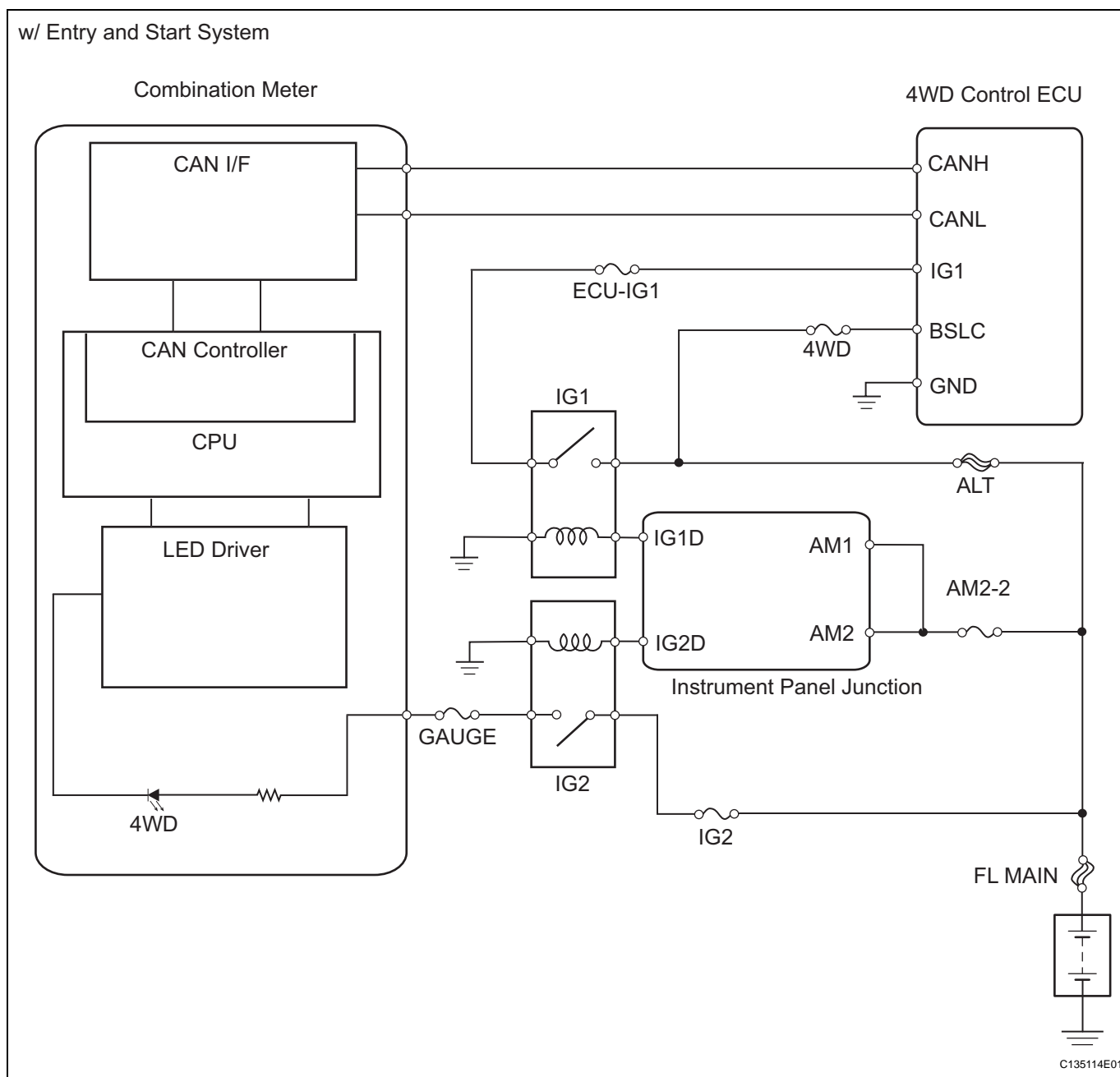
TF**NEXT****GO TO CAN COMMUNICATION SYSTEM**

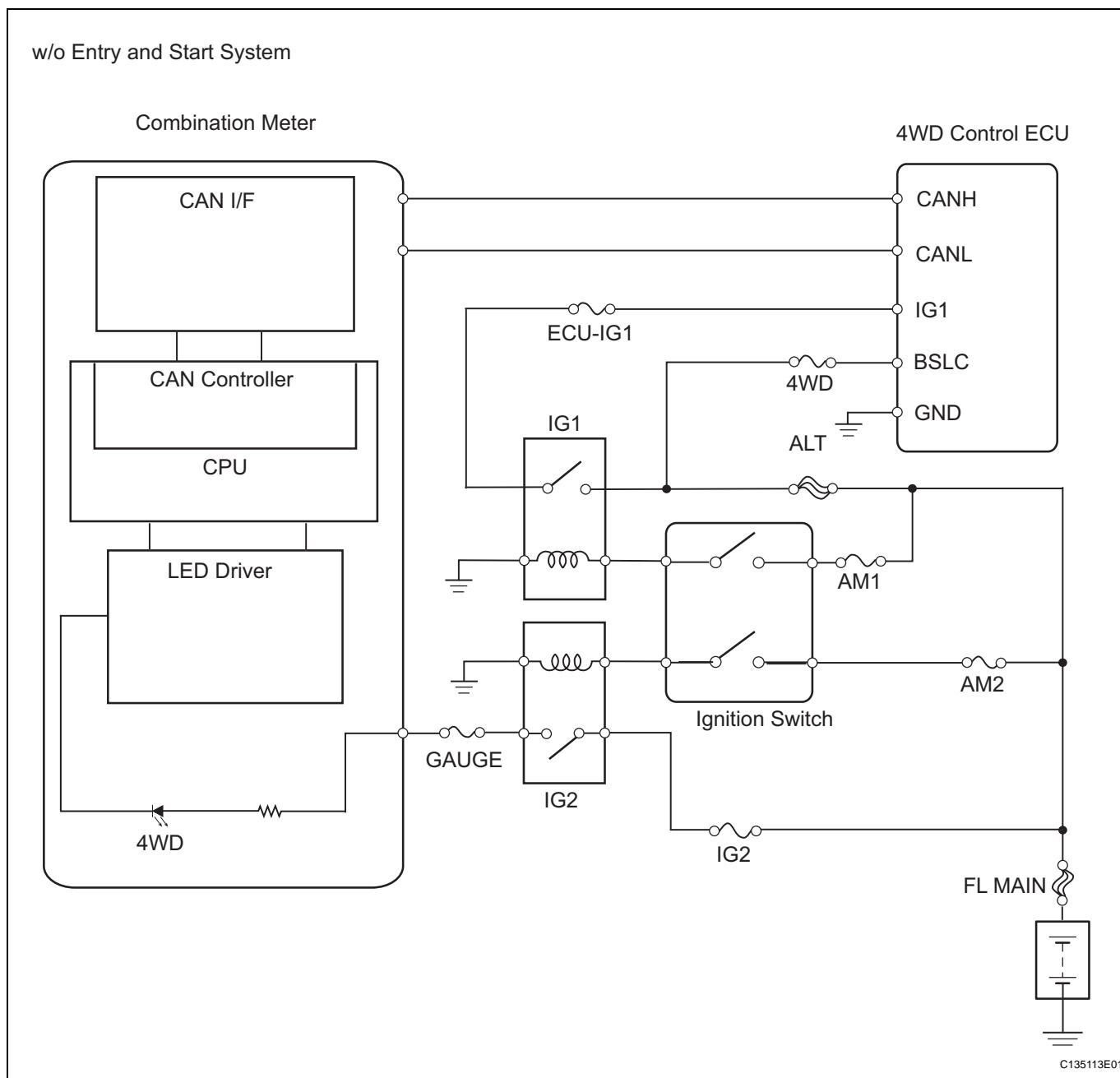
4WD Indicator Light Remains ON

DESCRIPTION

The 4WD control ECU is connected to the combination meter via the CAN communication system. If the 4WD control ECU stores any DTCs which are related to the active torque control 4WD system, the 4WD indicator light comes on in the combination meter.

WIRING DIAGRAM





INSPECTION PROCEDURE

HINT:

Check the condition of each related circuit connector before troubleshooting (see page IN-37).

1	CHECK FOR DTC
---	---------------

(a) Check the output DTC (see page [TF-16](#)).

Result

Result	Proceed to
Neither CAN communication system DTC nor 4WD control system DTC is output	A
CAN communication DTC is output	B
4WD control system DTC is output	C

HINT:

When DTCs indicating a CAN communication system malfunction are output, repair the CAN communication system before repairing each corresponding sensor.

B

REPAIR CIRCUIT INDICATOR BY OUTPUT CODE (CAN COMMUNICATION SYSTEM)

C

REPAIR CIRCUIT INDICATOR BY OUTPUT CODE (4WD CONTROL SYSTEM)

A**2****PERFORM ACTIVE TEST BY INTELLIGENT TESTER (4WD INDICATOR LIGHT)**

- (a) Using the intelligent tester's (with CAN VIM) ACTIVE TEST, generate a control command, and then check that the 4WD indicator light operates.

Combination Meter

Item	Vehicle Condition / Test Details	Diagnostic Note
4WD Indicator Light	4WD indicator light OFF	Observer combination meter

OK:

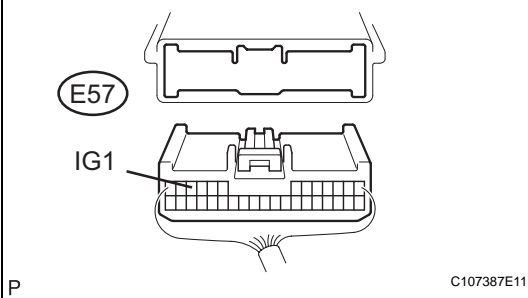
The 4WD indicator light turns OFF

OK

REPLACE 4WD CONTROL ECU

NG**3****CHECK WIRE HARNESS (4WD CONTROL ECU - BATTERY)**

Wire Harness Side



- (a) Disconnect the E57 ECU connector.
(b) Measure the voltage of the wire harness side connector.

Voltage

Tester Connection	Condition	Specified Condition
E57-11 (IG1) - Body Ground	Ignition switch ON	10 to 14 V

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK**4****CHECK COMBINATION METER**

- (a) Check the combination meter system.

Result:

The combination meter system is normal.

NG

REPLACE COMBINATION METER

TF

OK

REPLACE 4WD CONTROL ECU

4WD Indicator Light does not Come ON**DESCRIPTION**

Refer to "4WD Indicator Light Remains ON" (see page [TF-36](#)).

WIRING DIAGRAM

Refer to "4WD Indicator Light Remains ON" (see page [TF-36](#)).

INSPECTION PROCEDURE

HINT:

Check the condition of each related circuit connector before troubleshooting (see page [IN-37](#)).

TF**1 CHECK CAN COMMUNICATION SYSTEM**

- (a) Check if the CAN communication system DTC is output.

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

HINT:

When DTCs indicating a CAN communication system malfunction are output, repair the CAN communication system before repairing each corresponding sensor.

B**REPAIR CAN COMMUNICATION SYSTEM****A****2 PERFORM ACTIVE TEST BY INTELLIGENT TESTER (4WD INDICATOR LIGHT)**

- (a) Using the intelligent tester's (with CAN VIM) ACTIVE TEST, generate a control command, and then check that the 4WD indicator light operates.

4WD control ECU

Item	Test Details	Diagnostic Note
4WD Indicator light	4WD indicator light ON / OFF	Observe combination meter

OK:

The 4WD indicator light turns ON and OFF.

OK**REPLACE 4WD CONTROL ECU****NG****3 CHECK COMBINATION METER**

- (a) Inspect the combination meter (see page [ME-31](#)).

Result:

The combination meter assembly system is normal.

NG

REPLACE COMBINATION METER

OK

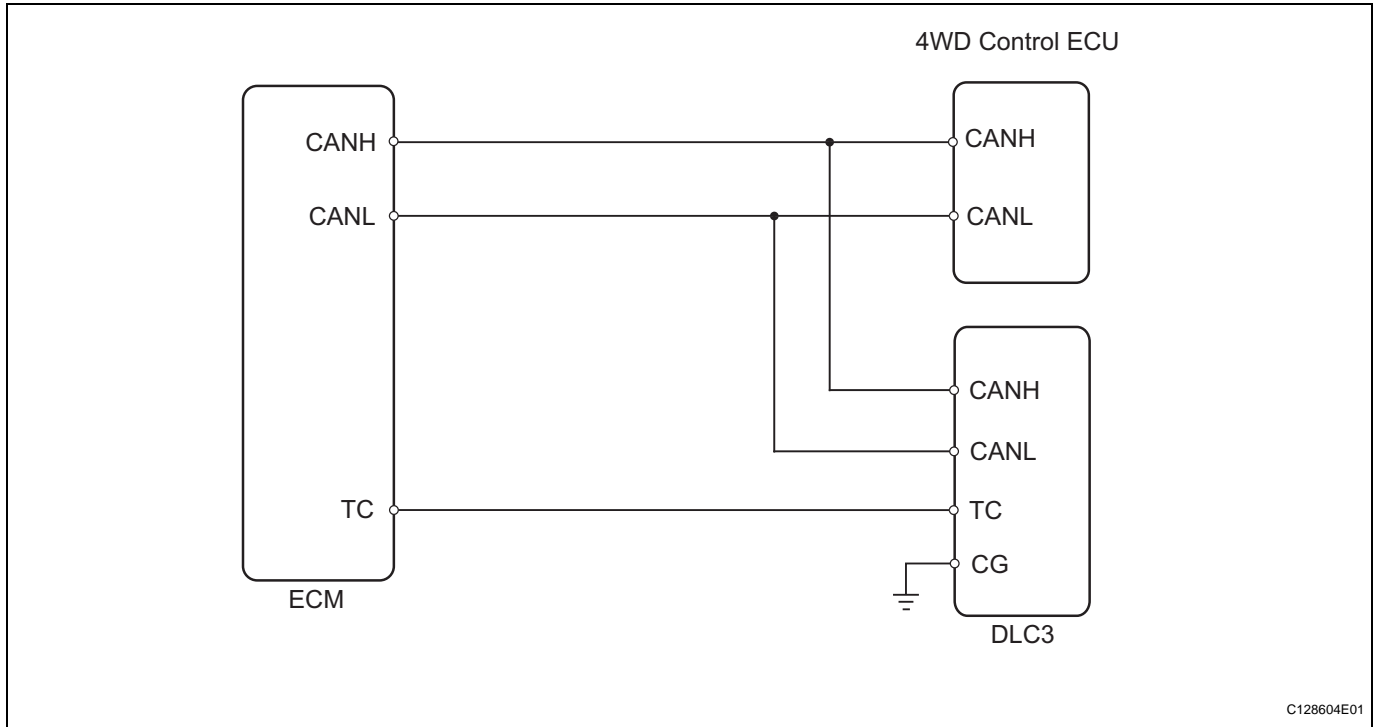
REPLACE 4WD CONTROL ECU

TC and CG Terminal Circuit

DESCRIPTION

Connecting terminals TC and CG of the DLC3 causes the 4WD control ECU to display 2-digit DTCs by flashing the 4WD indicator light.

WIRING DIAGRAM

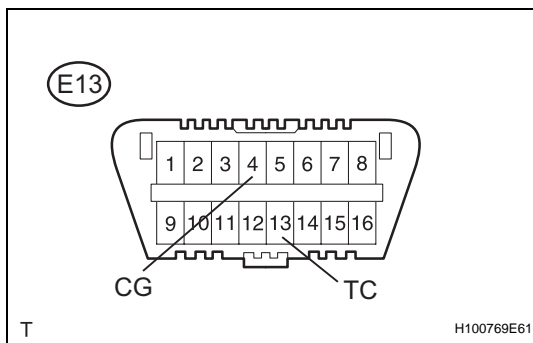


INSPECTION PROCEDURE

HINT:

Check the condition of each related circuit connector before troubleshooting (see page [IN-37](#)).

1 CHECK DLC3 (TC VOLTAGE)



- (a) Turn the ignition switch ON.
 - (b) Measure the voltage of the DLC3.
- Standard voltage**

Tester Connection	Specified Condition
E13-13 (TC) - E13- 4 (CG)	10 to 14 V

NG

Go to step 3

OK

2

CHECK CAN COMMUNICATION SYSTEM

- (a) Check if the CAN communication DTC is output (see page CA-10).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B

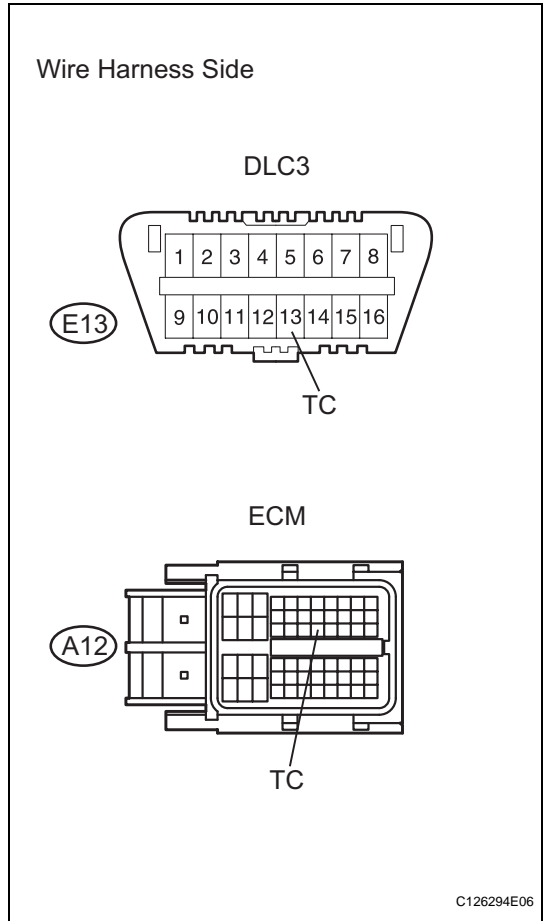
REPAIR CIRCUIT INDICATED BY OUTPUT DTC

A

REPLACE 4WD CONTROL ECU

3

CHECK WIRE HARNESS (DLC3 - ECM AND BODY GROUND)



- (a) Turn the ignition switch OFF.
(b) Disconnect the A12 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

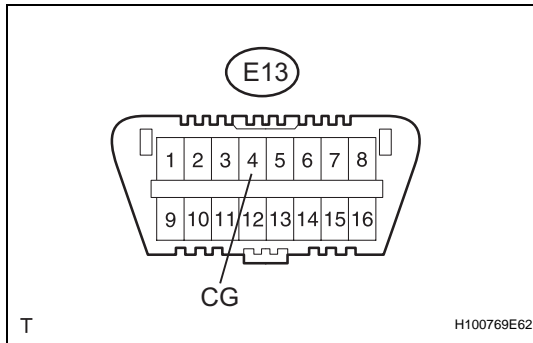
Standard resistance

Tester Connection	Specified Condition
E13-13 (TC) - A12-27 (TC)	Below 1Ω
E13-13 (TC) - Body Ground	10kΩ or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4 CHECK WIRE HARNESS (DLC3 - BODY GROUND)

(a) Measure the resistance of the DLC3.

Standard resistance

Tester Connection	Specified Condition
E13-4 (CG) - Body ground	Below 1 Ω

B**REPAIR OR REPLACE HARNESS AND CONNECTOR****TF****A****5 CHECK CAN COMMUNICATION SYSTEM**

(a) Check if the CAN communication DTC is output (see page [CA-10](#)).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B**REPAIR CIRCUIT INDICATED BY OUTPUT DTC****A****REPLACE 4WD CONTROL ECU**